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(54) **KEY PAD USER INTERFACE FOR NON-VERBAL, COMMUNICATION SYSTEM**

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G06F 3/023 (2006.01)

(52) **U.S. Cl.**
CPC **G06F 3/0238** (2013.01); **G06F 3/0233** (2013.01)

(58) **Field of Classification Search**
None
See application file for complete search history.

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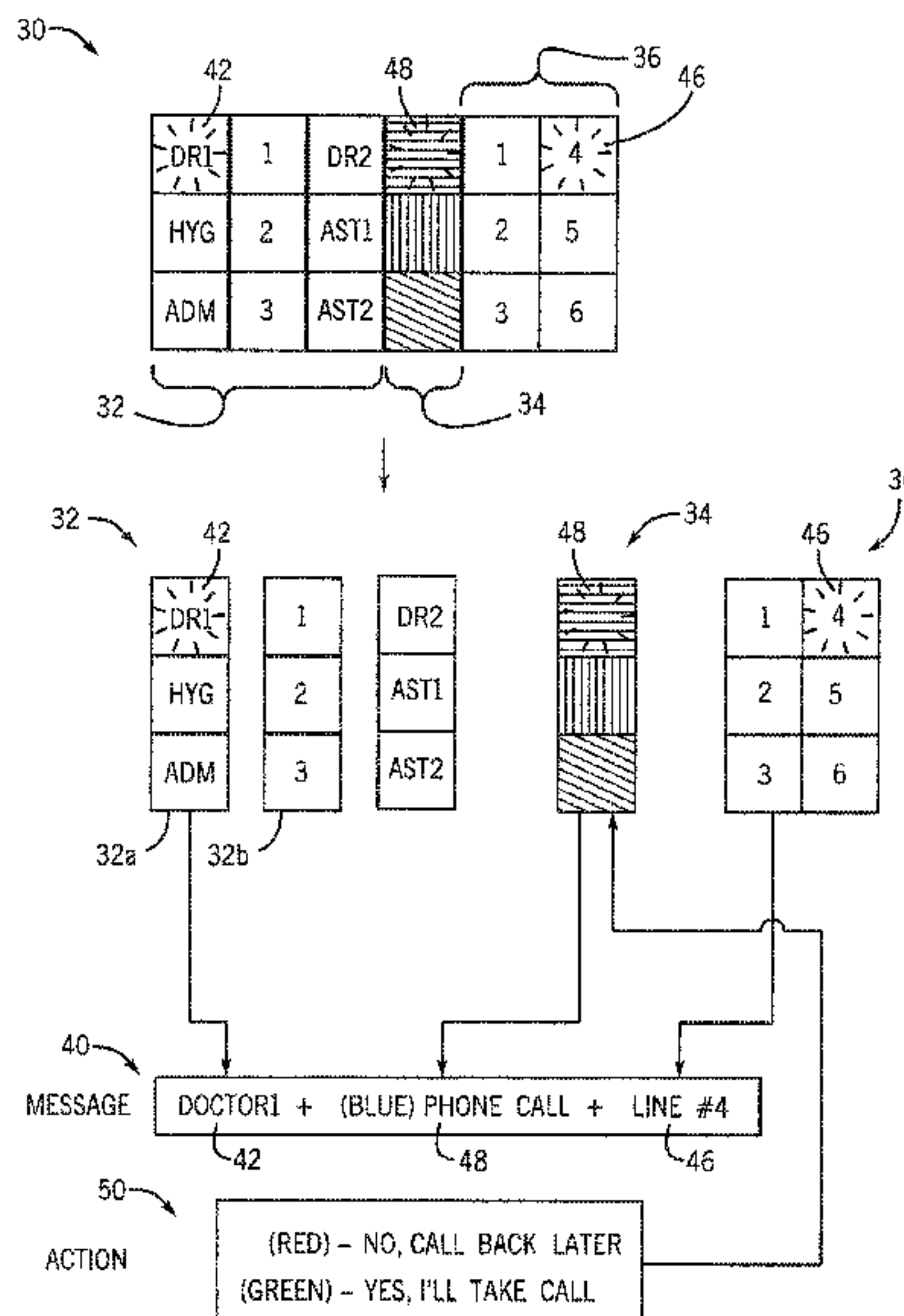
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(57) **ABSTRACT**

A system and keypad interface is disclosed that allows users to communicate with non-verbal cues. Embodiments include an optimal key pattern(s) to minimize human time using the control interface. Aspects of the system block the natural reading process and rely on pattern recognition, thus users can enter and respond to messages more quickly without the cognitive upset of reading messages that rely solely on left to right or vice versa. The grouping of the keys optimizes or minimizes the time a human uses the control system based on how the human brain interprets visual information. Some embodiments include messages delivered by tones associated with button presses. The tones may provide a non-verbal communication without the recipient needing to see the panels.

7 Claims, 8 Drawing Sheets



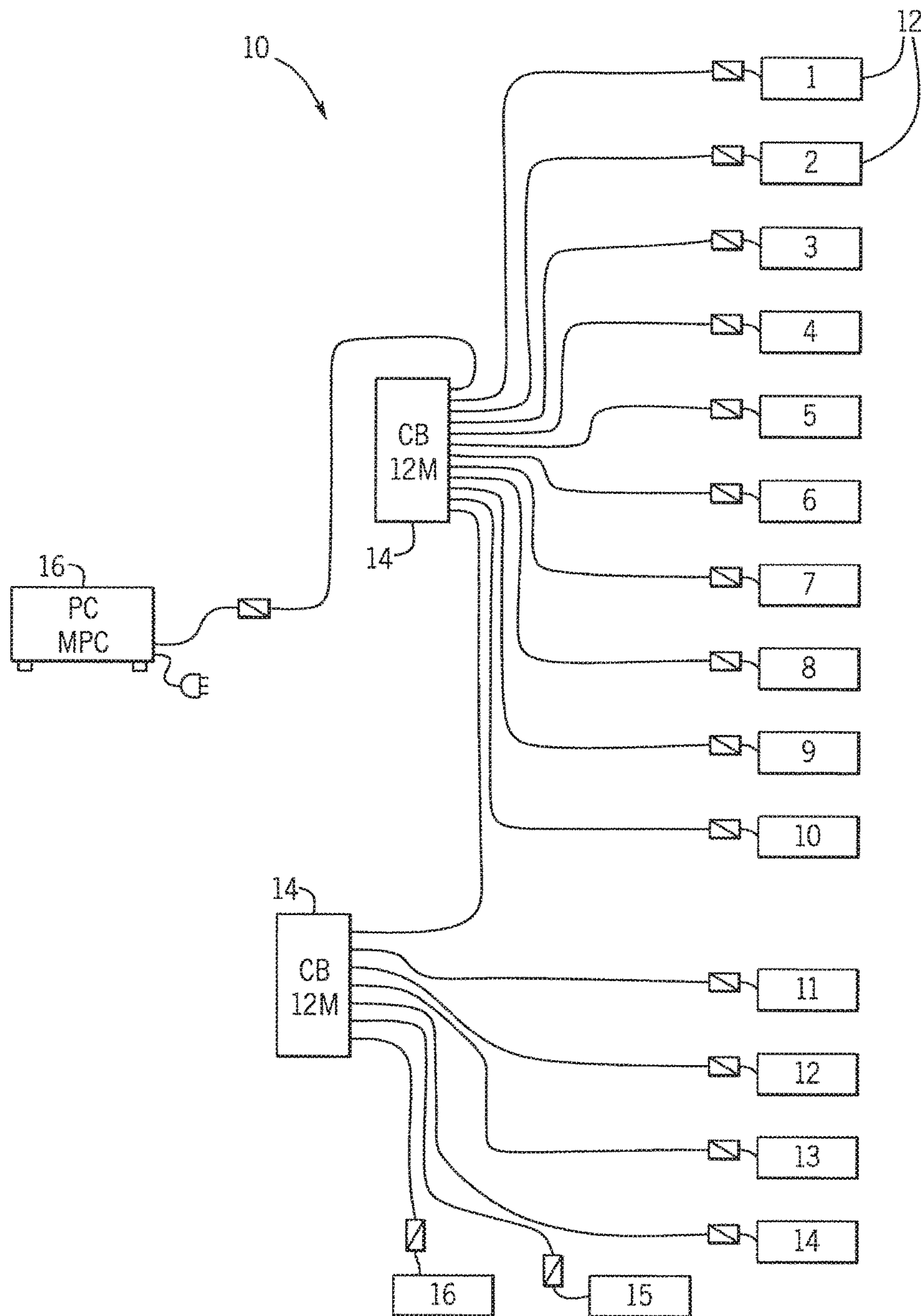


FIG. 1

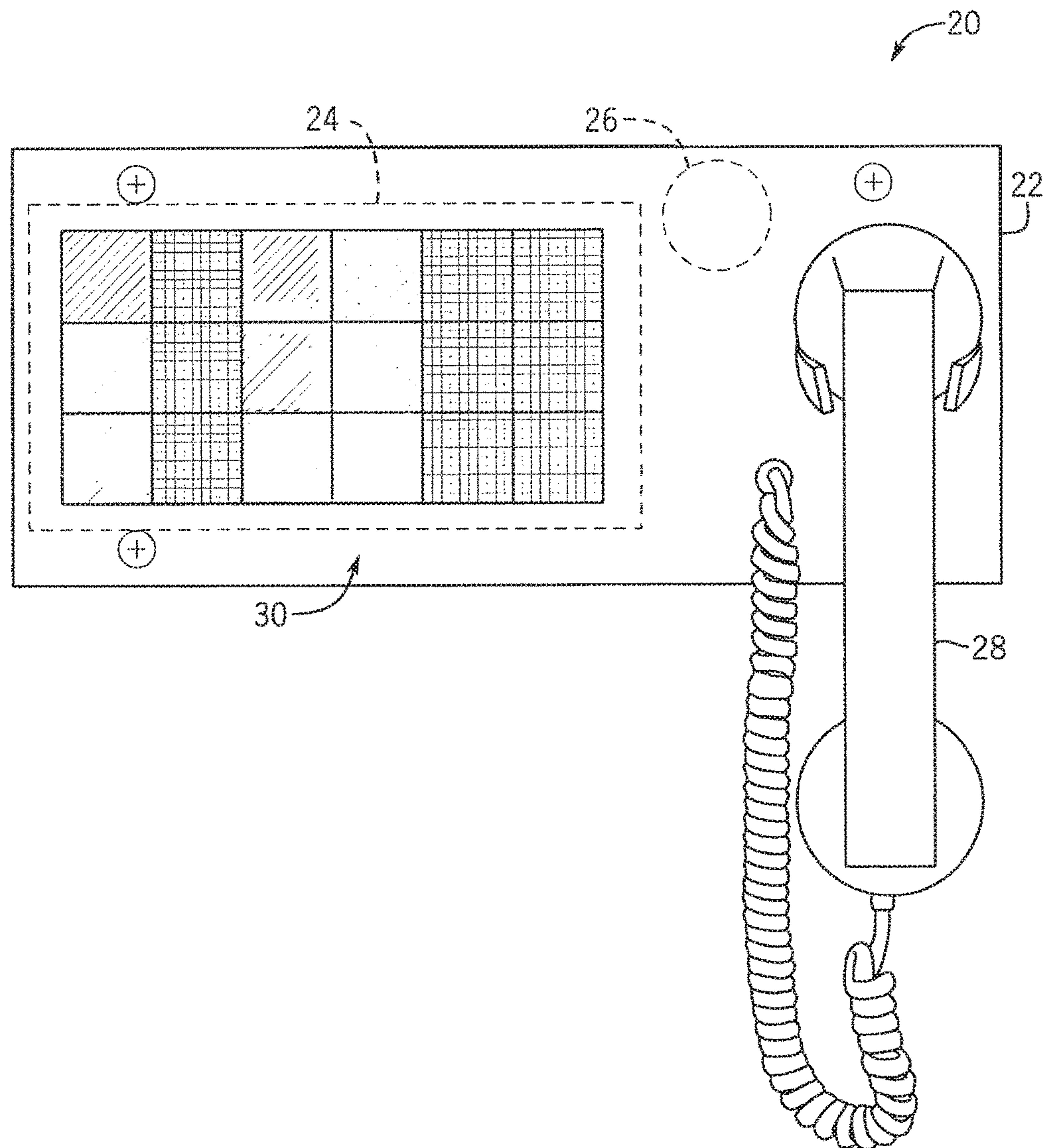


FIG. 2

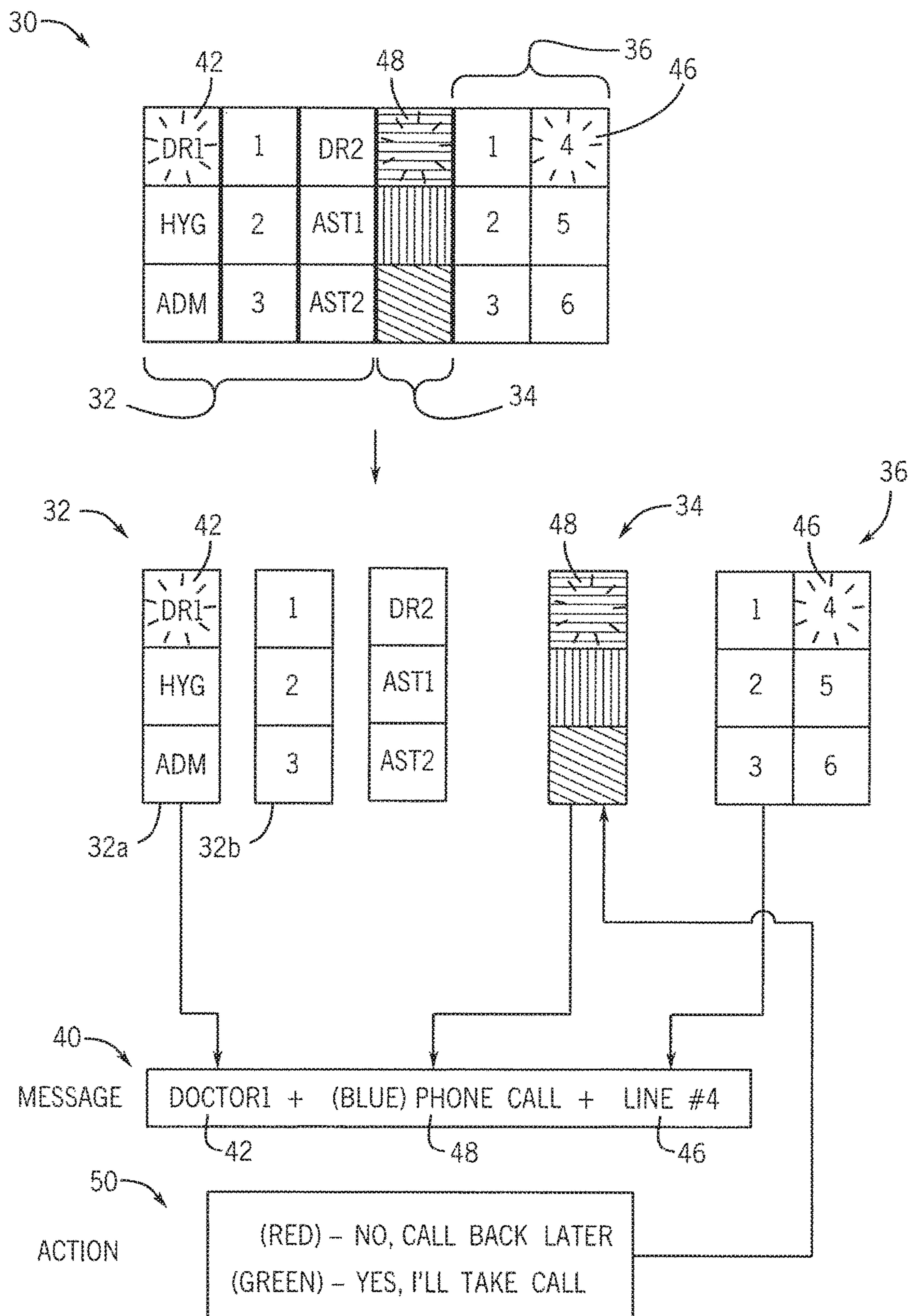


FIG. 3

FIG. 4A

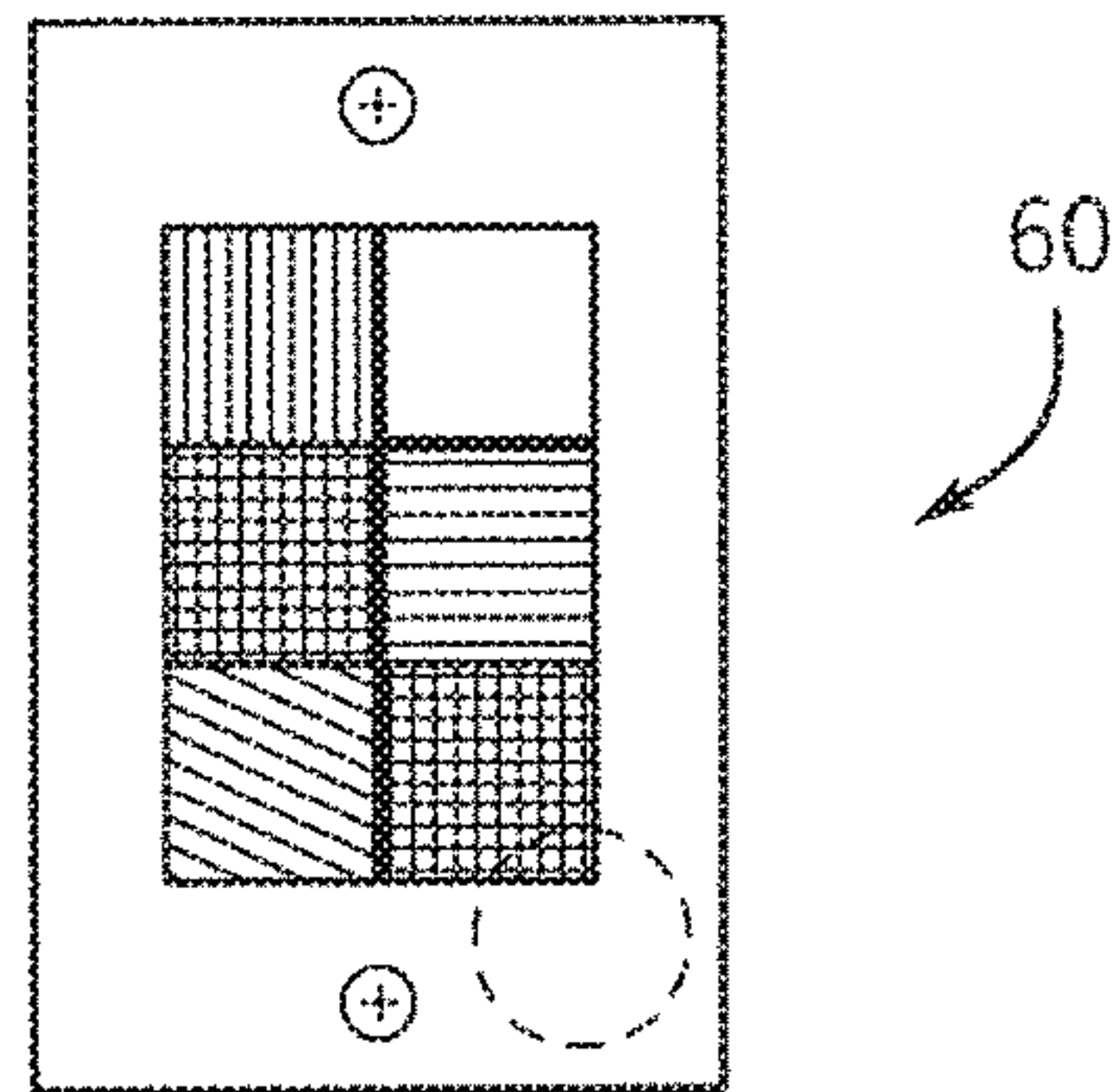


FIG. 4B

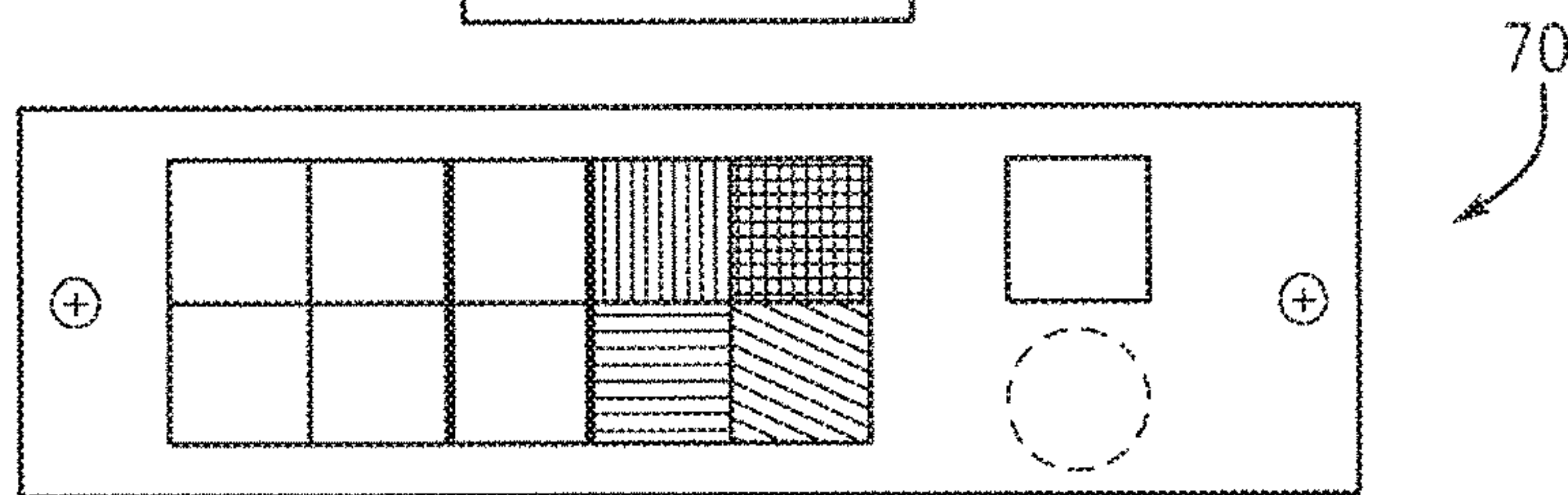


FIG. 4C

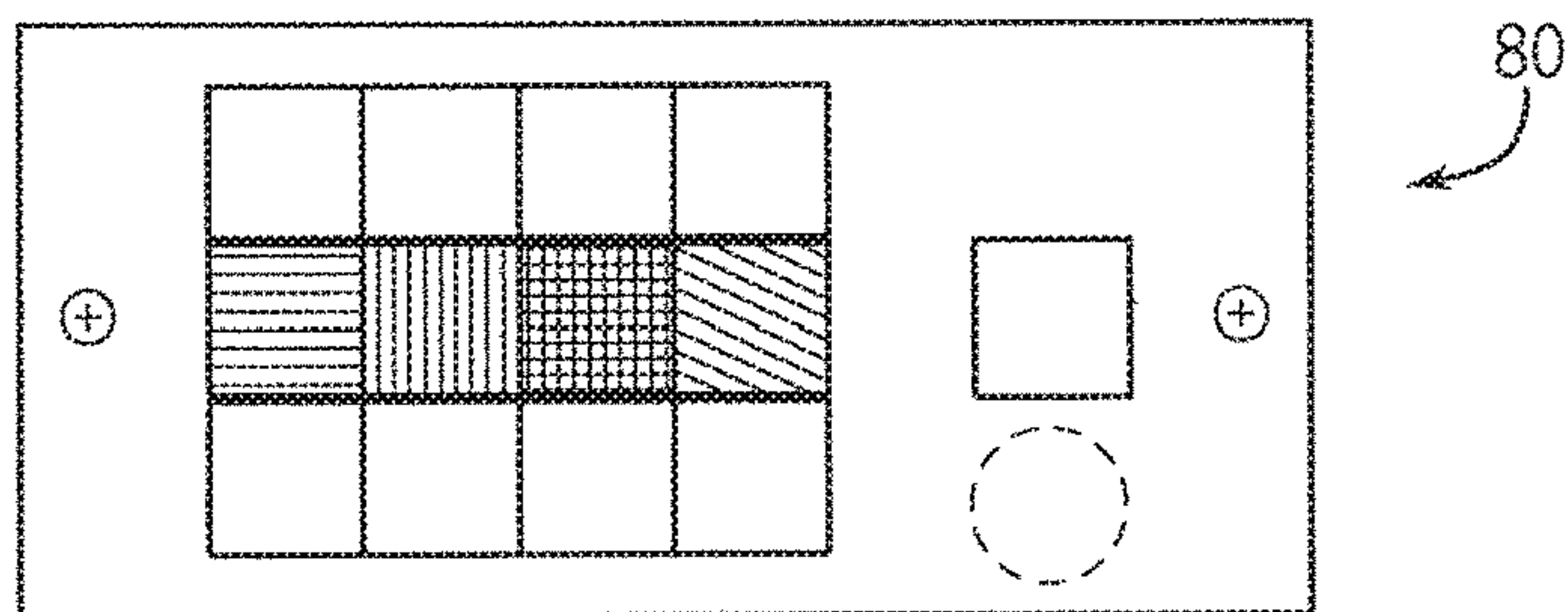


FIG. 4D

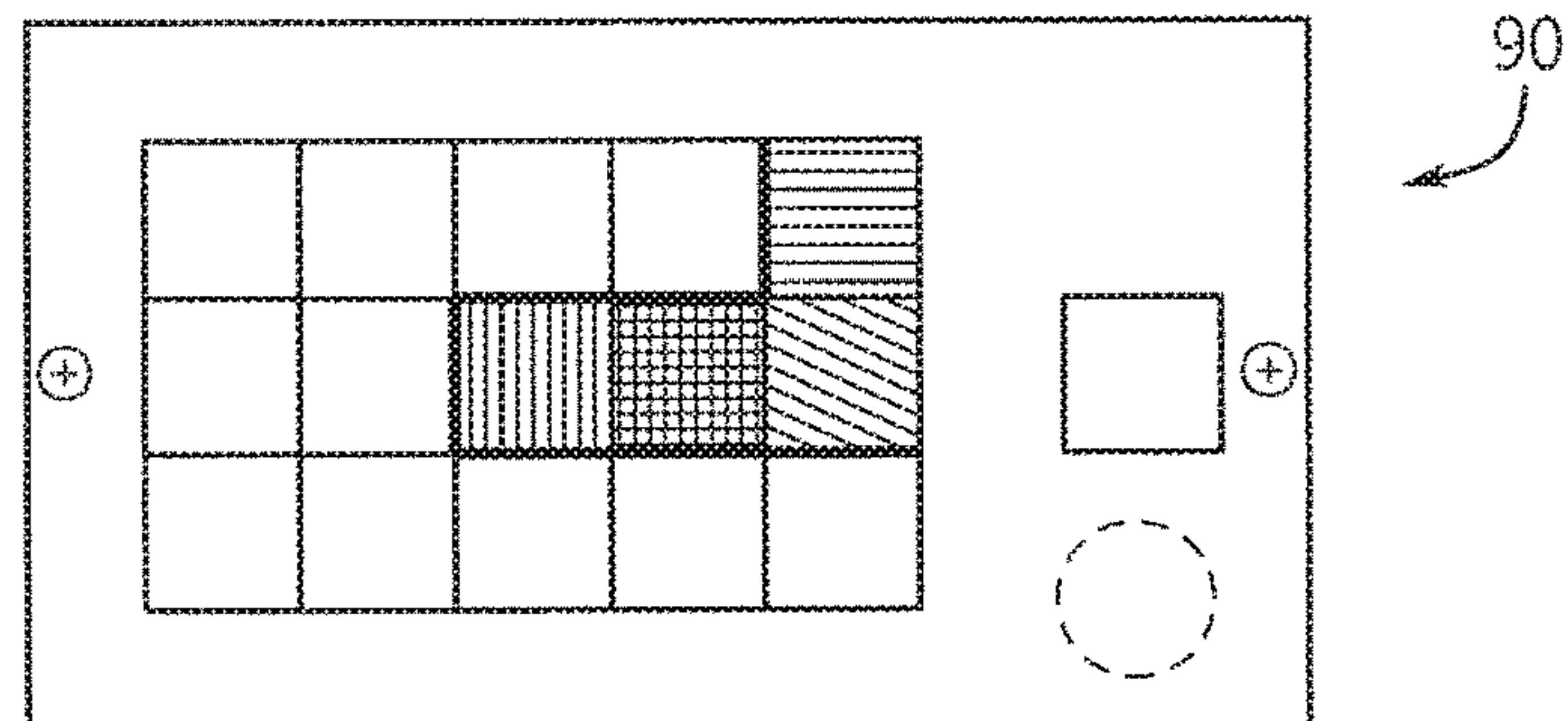
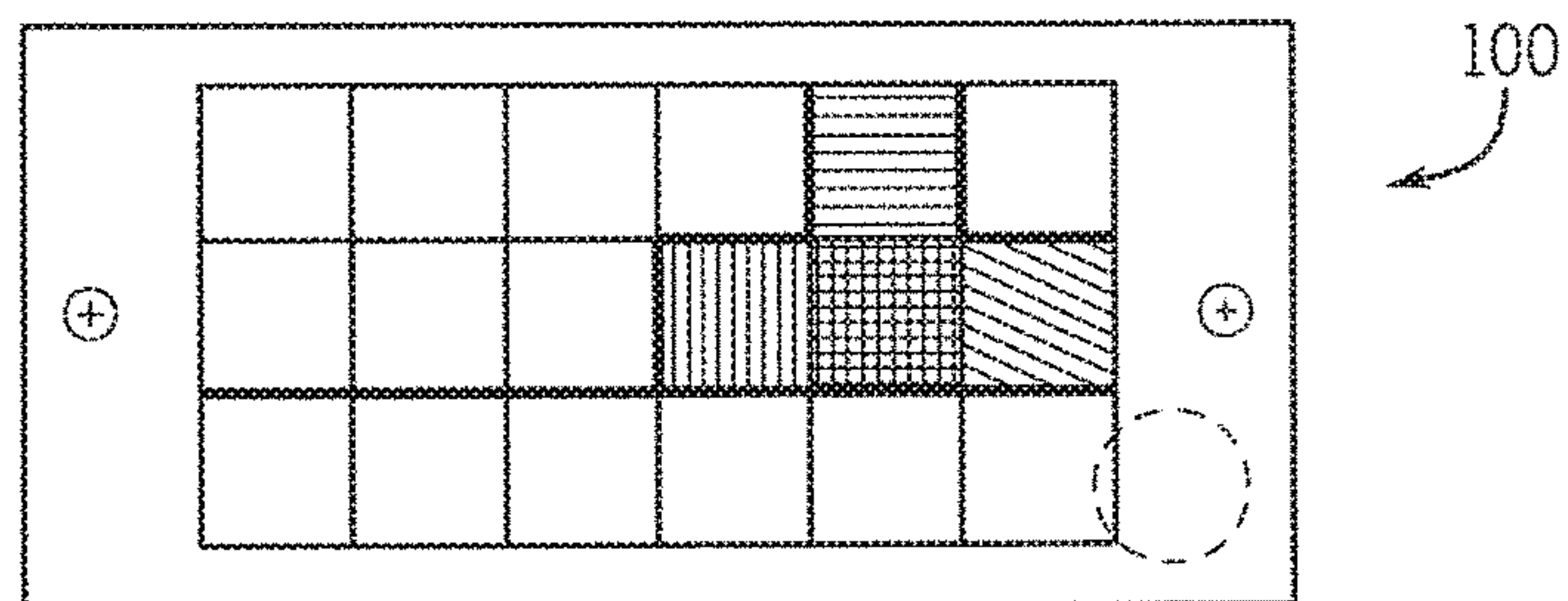


FIG. 4E



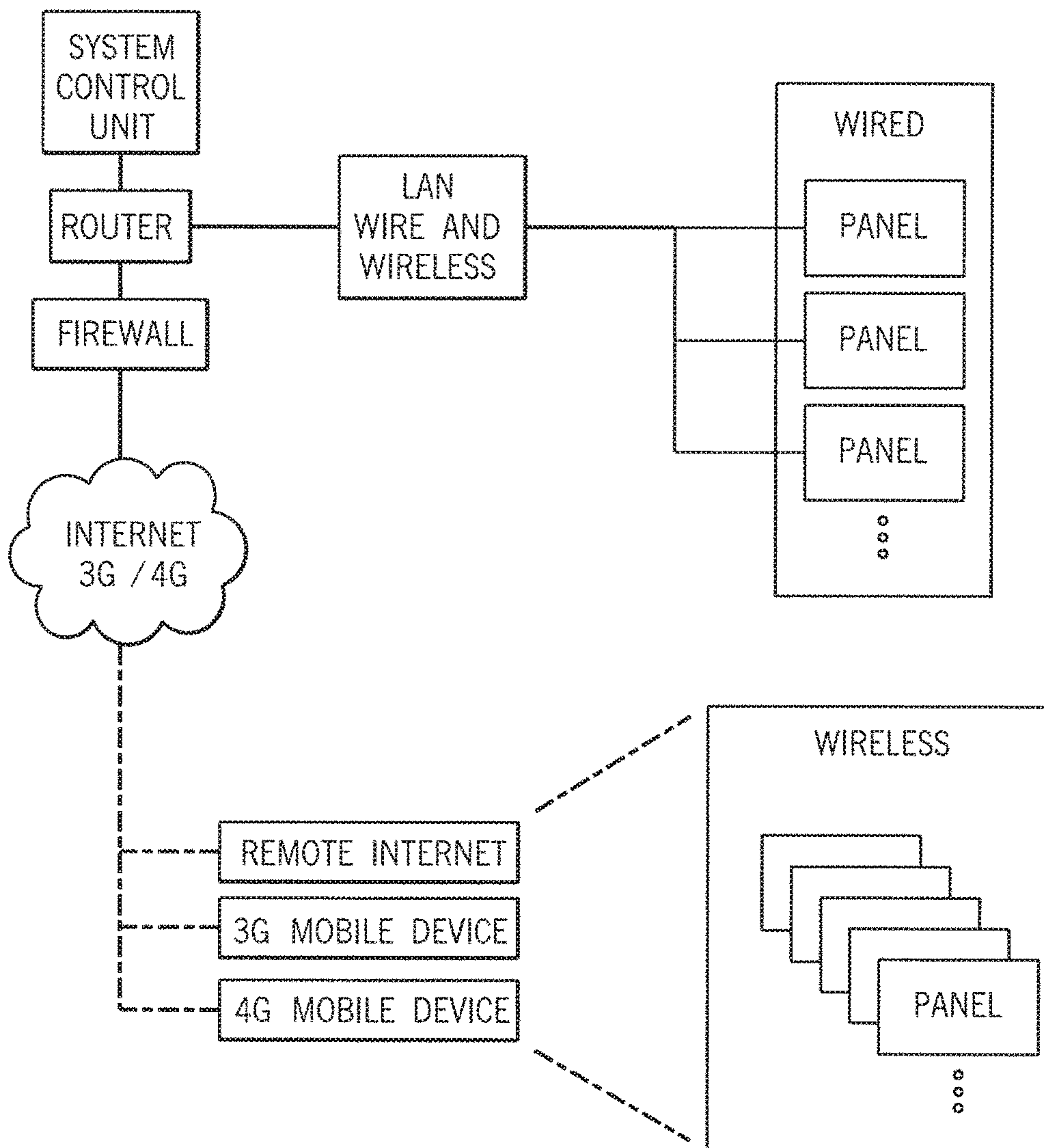


FIG. 5

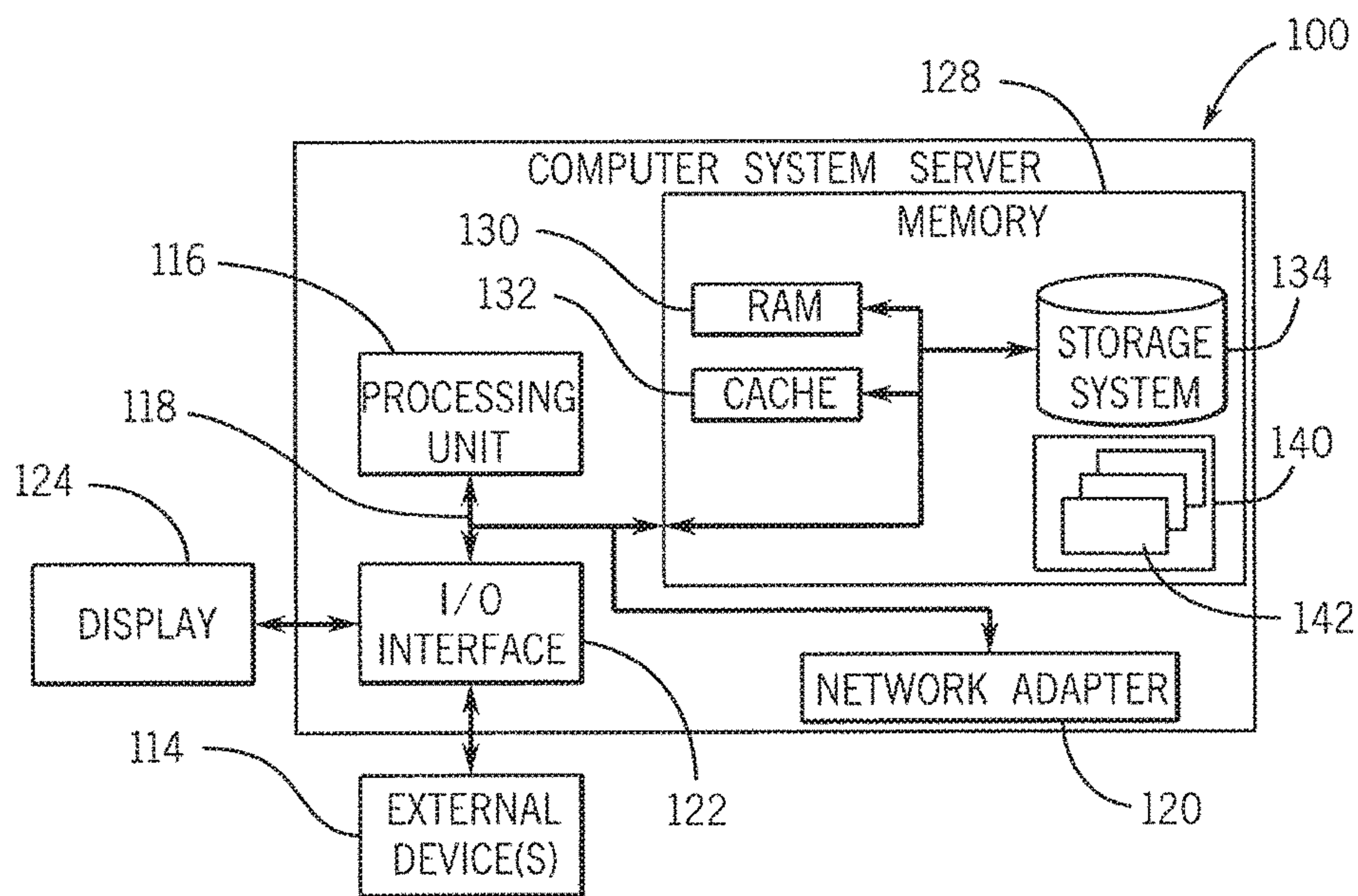


FIG. 6

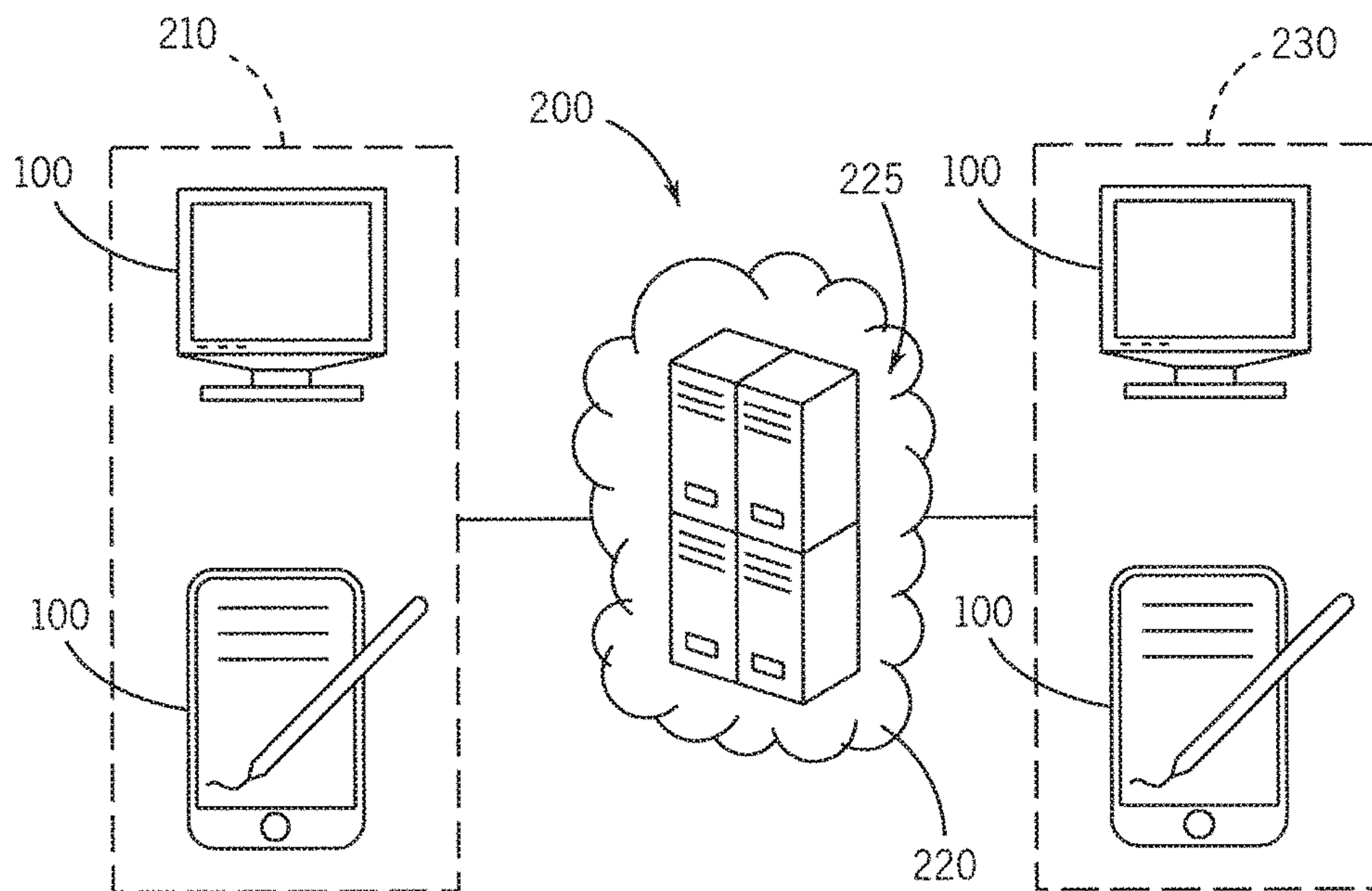


FIG. 7

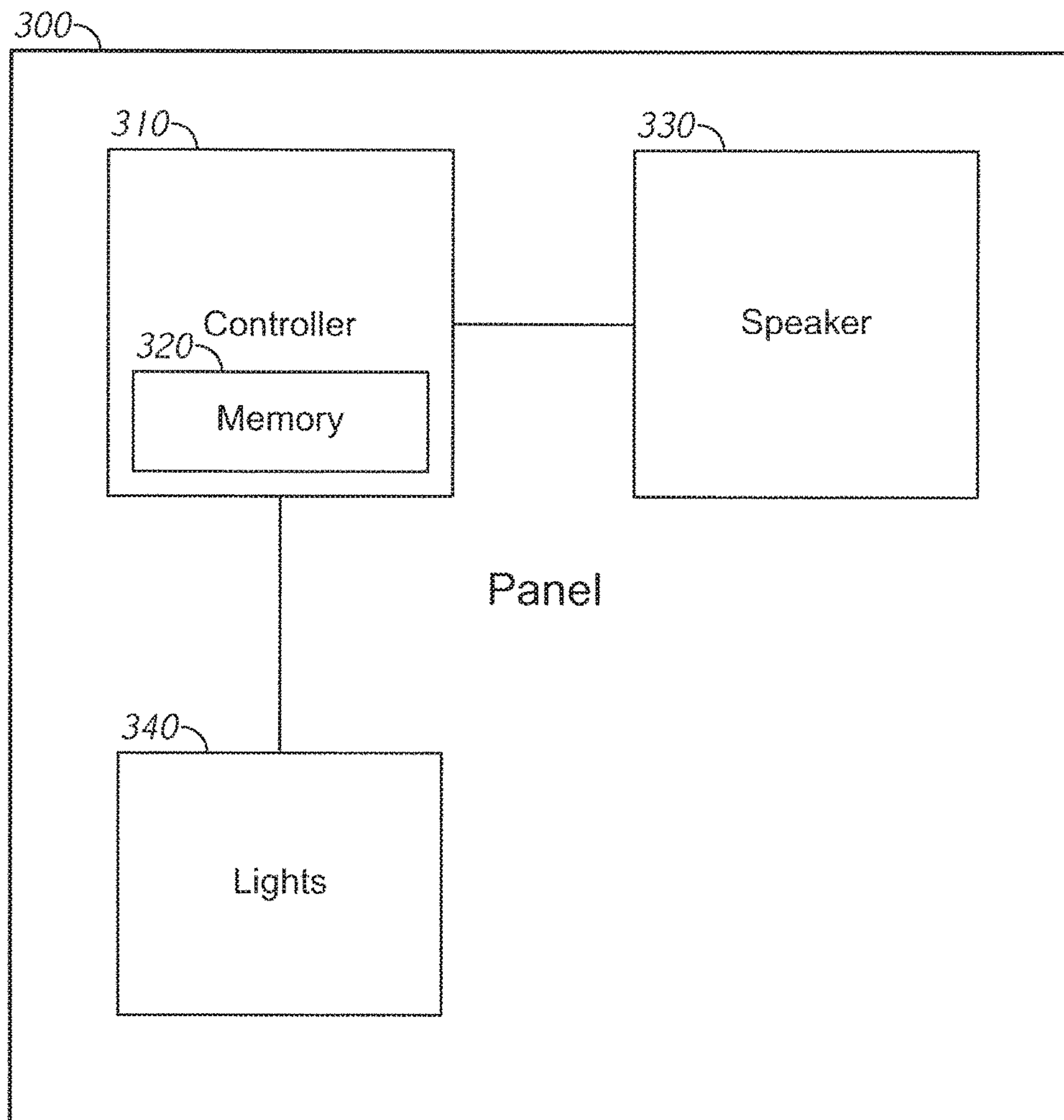


FIG. 8

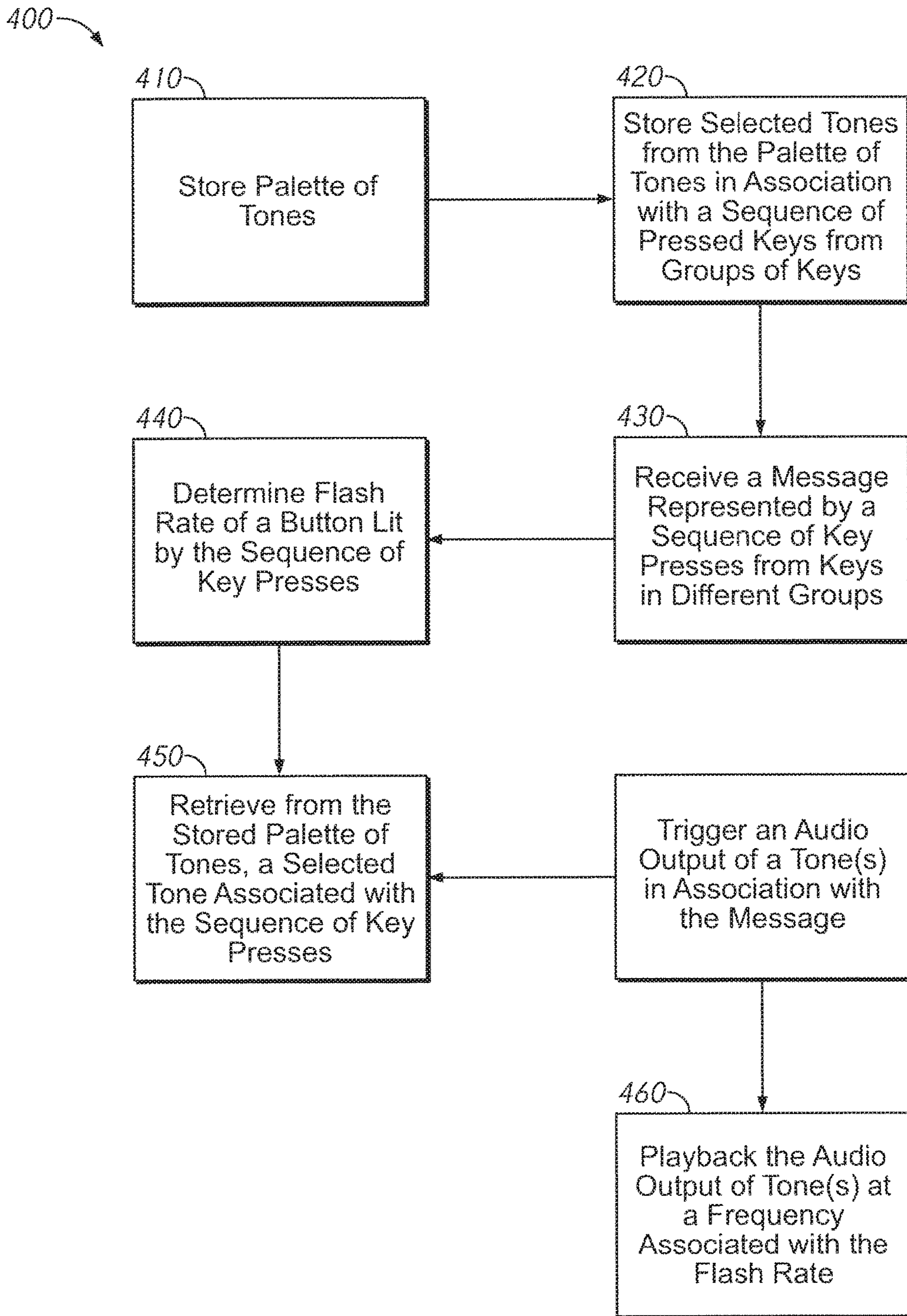


FIG. 9

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KEY PAD USER INTERFACE FOR NON-VERBAL, COMMUNICATION SYSTEM

CROSS REFERENCE TO RELATED APPLICATIONS

This application claims benefit under 35 U.S.C. § 119(e) of U.S. Provisional Application having Ser. No. 62/302,712 filed Mar. 2, 2016, and to U.S. Non-Provisional application Ser. No. 15/448,548, filed Mar. 2, 2017, which are hereby incorporated by reference herein in its entirety.

BACKGROUND

The embodiments herein relate generally to a system for non-verbal communication optimized to minimize user time and maximize understanding of messages by placement and arrangement of buttons.

Managing processes in real-time requires process control inputs that occur timely. Control of human-based processes requires inputs and outputs to other humans and must augment how the brain recognizes and interprets communication. In many professional office settings, communication between the professional and any assistants is critical in many situations. Conventional communication is performed by written messages (a text transcribed from a voice message primarily) from one party to the other. However, reading is a very slow brain function, therefore any user interface that requires the eye to “read scan” left to right become very slow in comparison. There is a challenge to achieve balance between message content importance and the overhead to receive and interpret the message. Also reading is a cognitive function that suspends other cognitive functions required by the human user to complete a task performed in parallel. Some prior art systems likewise use keypad implementations that force the user to read left to right and top down just as a text message. They require a lot of time to enter and interpret each message and therefore waste \$1000’s of dollars monthly.

Embodiments of the present invention provide a system that solves the time lag in communicating between parties.

SUMMARY

In one aspect, a system comprising a plurality of keypad interface panels is disclosed. Each panel includes: a speaker; a memory storage module including stored electronic files of tones, a memory storage module including stored electronic files of tones, a plurality of grouped sets of touch-enabled keys, each set of keys in a group is arranged in a vertical grouping as defined by a common function, wherein a first group of keys is designated to represent pre-set persons within an office setting, a second group of keys is designated to represent a pre-designated action within the office setting, a third group of keys is designated to represent a location in the office setting, and when a first selected key within the first group of keys, a second selected key within the second group of keys, and a third selected key within the third group of keys are pressed, emits, by the speaker, a selected tone from the stored electronic files of tones and represents an audible and non-verbal form of communication between the plurality of keypad interface panels identifying a selected person, a selected action for the selected person, and a selected location for the selected person to perform the selected action; one or more communication cables connecting the plurality of keypad interface panels; and a central switchbox controller configured to control the receipt and

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transmission of signals between the plurality of keypad interface panels through the one or more communication cables.

BRIEF DESCRIPTION OF THE FIGURES

The detailed description of some embodiments of the invention is made below with reference to the accompanying figures, wherein like numerals represent corresponding parts of the figures.

FIG. 1 is a schematic view of a system for non-verbal communication according to embodiments of the subject technology.

FIG. 2 is a front view of a user interface panel for the system of FIG. 1 according to an exemplary embodiment.

FIG. 3 shows front views of a keypad in unexploded and exploded views according to an exemplary embodiment.

FIGS. 4A, 4B, 4C, 4D, and 4E are front views of keypad configurations according to alternative embodiments.

FIG. 5 is a block diagram of a communication network for a system of non-verbal communication integrating wired and wirelessly connected panels according to an exemplary embodiment.

FIG. 6 is a block diagram of a computing device according to an exemplary embodiment.

FIG. 7 is a block diagram of a network according to an exemplary embodiment.

FIG. 8 is a block diagram of a user interface panel according to an exemplary embodiment.

FIG. 9 is a flowchart of a method of delivering a non-verbal communication through tones according to another embodiment.

DETAILED DESCRIPTION OF CERTAIN EMBODIMENTS

Broadly, embodiments of the subject technology provide a system and keypad interface that allows a user to communicate messages to other parties in the system with non-verbal cues. In professional offices treating patients, visual and non-verbal cues may be necessary to provide quick communication between parties that are in separate locations (for example, different rooms). Some situations, for example, dentistry or other medical environments often have patients in temporary positions of discomfort or are in need of critical attention where seconds matter and there is little time to pick up a phone and discuss what is needed. Visual and non-verbal control occurs optimally when control messages are patterns of lighted keys. Embodiments herein describe an optimal key pattern(s) to minimize human time using the control interface. Aspects of the system block the natural reading process and rely on pattern recognition, thus users can enter and respond to messages more quickly without the cognitive upset of prior art approaches. The grouping of the keys optimizes or minimizes the time a human uses the control system based on how the human brain interprets visual information.

Referring now to FIG. 1, an exemplary embodiment of a system 10 includes a plurality of keypad interface panels 12 (referred to generally as “panels 12”) connected in communication to one another. In the exemplary embodiment shown, the panels 12 are hard wired. While not shown in their actual physical position, it will be understood that each panel 12 may be in its own room while some embodiments may include more than one panel 12 to a room but each panel 12 is in a position that would be visually easily recognizable to personnel. The panels 12 may be connected

to one or more switchboxes **14**. If more than one switchbox **14** is included, then the switchboxes **14** may be mutually connected to a computing device or multiplexing device **16**. While sixteen panels **12** are shown, it will be understood that any number of panels **12**, two or more may be included in the system.

Referring now to FIGS. **2** and **3**, a station **20** is shown according to an exemplary embodiment. The station **20** includes a keypad interface panel **22**. Some embodiments include a phone handset **28** when a situation affords time for verbal communication. The panel **22** includes an array **30** of keys that when pressed, illuminate at the station **20** and illuminate corresponding or the same keys on other stations **20** that are connected to the present station **20**. The array **30** may be supported by a circuit board **24** that is normally hidden by the panel **22** housing and whose outline is shown in dashed lines to represent that it is hidden from view. In some embodiments, keys may use alphanumeric indicia and/or color to represent the various parts of the message. Some embodiments may include an audible alert tone provided by speaker **26** upon the entry of a key based message.

In an exemplary embodiment, the array **30** of keys are arranged into vertical groups (**32**; **34**; **36**). The groups (**32**; **34**; **36**) represent different categories of functions or personnel as understood by users within the system. The keys within a respective group (**32**; **34**; **36**) are arranged vertically relative to each other key in the same group. Some key groups may be further divided into sub-groups. For example, group **32** may comprise key groups **32a** and **32b**. The group of keys **32a** may represent a group of personnel individuals. The key **42** represents a first doctor in the facility. Other keys not called out but labeled may represent for example a hygienist, an administrative assistant, a second doctor, and two different assistants. The group of numbered keys **32b** between the labeled personnel keys may represent in this example, the ability to designate one of the personnel labels with a pre-designated person (for example a first hygienist, a second hygienist, etc.). This adds flexibility to the system when defining who represents certain key presses. The group of keys **34** may represent actions to be taken by a personnel member. The group of keys **36** may represent numbered objects (for example, phone lines, rooms, etc.). The group of keys **48** may be colored to represent pre-defined actions. Colored keys as will be appreciated, play a role in visual interpretation by providing the user a quick recognition of an action associated with the color. More than one group of colored keys may be present to represent more than one type of action within a message. As will also be appreciated, the placement of colored keys between the alphanumeric indicia helps one to discern between the groups representing people and/or locations as it is easier to separate cues related to people and places when interrupted by color. Thus a message string is easily interpreted when presented in the form of person-number-action represented by color- and follow-up text/number. As will be understood, other formats may be implemented depending on the application and needs of the customer user.

Keys **42**, **46**, and **48** are illustrated with radiating lines to represent keys that have been pressed and illuminated in an example of use. The groups (**32**; **34**; **36**) may be positioned left to right or left and right of each other to provide an easily identifiable sequence of actions that can be visually interpreted from illuminated keys. In the example shown, the table **40** provides an interpretation of the pressed key sequence. The key sequence indicates that an alert is being sent to Doctor1 (represented by key **42**) that a phone call (represented by blue colored key **48**) is waiting his answer

on line number **4** (as represented by key **46**. The doctor may respond by pressing one of the other keys in group **34** which indicates whether he or she will take the call or call back later (see table **50**). As will be appreciated, the eye/brain processing for reading is blocked by the vertical disposition of the key groups (**32**; **34**; **36**) leading to significantly less time to input and interpret the message. Instead of users needing to find another person, enter another room, and discuss what needs to be performed (which may take minutes), users in a facility are able to interpret the non-verbal message provided by aspects of the system disclosed in a matter of a second if not less than a second. Testing shows the subject technology disclosed herein allows users to communicate 10-20 times faster than some other prior art approaches. For example, in comparison to systems which rely primarily on horizontally grouped keys, the horizontal key group approach suffer from 3-5 times more time required to process a non-verbal communication than the vertically grouped keys in the interface panels **22** disclosed. The disclosed system is indiscriminate in terms of who sees the message. The message is so concise that every staff member will only need to look at the panel for a brief moment and the targeted staff member will be able to respond using reaction to the displayed key sequence alone. As will be appreciated, over the course of a busy working day, the aggregate time savings provided by the subject technology saves an office a lot in time spent communicating which can translate into more patients being attended.

FIGS. **4A**, **4B**, **4C**, **4D**, and **4E** show keypad panels **60**, **70**, **80**, **90**, and **100** respectively which include alternate key grouping embodiments. While an exemplary embodiment is proposed using primarily vertical key group arrangements, some embodiments may still yet benefit from the subject technology by varying the positions of keys in groups as shown.

Referring now to FIG. **5**, elements of the system may be positioned in multiple rooms (or in embodiments using software on a computing device, may sometimes be in the same room visible to parties in the room). One or more rooms in for example the office setting may have its own keypad interface. Elements of the system are readily adaptable or installation without the need to radically retrofit existing walls as shown. The multiple keypad interfaces may be connected via hardwire. Thus some embodiments may include a mix of hardwired panels connected with wireless panels. (And in some embodiments it is contemplated using a wireless network). In some embodiments, the multiple lines are coupled to a master controller (labeled "system control unit") which may be for example a computer or other processor based switchbox to control which messages are sent/received by which rooms and to control the content of the messages by lighting up the correct keys on receiving keypad interfaces. An example connection scheme along with an exemplary installation process is shown. Some embodiments may use a software application interfaced through a computing device (described more fully below). The master controller may receive wireless signals through cellular telephony or Internet connection, which are integrated into any other wirelessly connected device or hardwired device accordingly.

Referring now to FIG. **6**, a schematic of an example of a computer system/server **100** (sometimes referred to above as a computing device) is shown. The computer system/server **100** may serve the role as the machine implementing for example the functions of storing functions or persons associated with a key, coordinating the communication of messages between panels, hosting a software application

embodiment, and routing messages through the Internet and/or cellular telephony networks between panels and computing devices. The components of the computer system/server **100** may include, but are not limited to, one or more processors or processing units **116**, a system memory **128**, and a bus **118** that couples various system components including the system memory **128** to the processor **116**.

The computer system/server **100** may perform functions as different machine types depending on the role in the system the function is related to. For example, the computer system/server **100** may be personal computer systems, tablet devices, mobile telephone devices, wearable smart devices, handheld or laptop devices, set top boxes, programmable consumer electronics when interfaced directly by users through a software application embodiment. In the role of a host for software applications, the computer system/server **100** may be server computer systems, multiprocessor systems, microprocessor-based systems, network PCs, and distributed cloud computing environments that include any of the above systems or devices, and the like. The computer system/server **100** may be described in the general context of computer system executable instructions, such as program modules, being executed by a computer system (described for example, below). In some embodiments, the computer system/server **100** may be a cloud computing node connected to a cloud computing network (not shown). The computer system/server **100** may be practiced in distributed cloud computing environments where tasks are performed by remote processing devices that are linked through a communications network. In a distributed cloud computing environment, program modules may be located in both local and remote computer system storage media including memory storage devices.

The computer system/server **100** may typically include a variety of computer system readable media. Such media could be chosen from any available media that is accessible by the computer system/server **100**, including non-transitory, volatile and non-volatile media, removable and non-removable media. The system memory **128** could include one or more computer system readable media in the form of volatile memory, such as a random access memory (RAM) **130** and/or a cache memory **132**. By way of example only, a storage system **134** can be provided for reading from and writing to a non-removable, non-volatile magnetic media device. The system memory **128** may include at least one program product **140** having a set (e.g., at least one) of program modules **142** that are configured to carry out the functions of embodiments of the invention. The program product/utility **140**, having a set (at least one) of program modules **142**, may be stored in the system memory **128** by way of example, and not limitation, as well as an operating system, one or more application programs, other program modules, and program data. Each of the operating system, one or more application programs, other program modules, and program data or some combination thereof, may include an implementation of a networking environment. The program modules **142** generally carry out the functions and/or methodologies of embodiments of the invention as described herein.

The computer system/server **100** may also communicate with one or more external devices **114** such as a keyboard, a pointing device, a display **124**, etc.; and/or any devices (e.g., network card, modem, etc.) that enable the computer system/server **100** to communicate with other computing devices. Such communication can occur via Input/Output (I/O) interfaces **122**. Alternatively, the computer system/server **100** can communicate with one or more networks

such as a local area network (LAN), a general wide area network (WAN), and/or a public network (e.g., the Internet) via a network adapter **120**. As depicted, the network adapter **120** may communicate with the other components of the computer system/server **100** via the bus **118**.

As will be appreciated by one skilled in the art, aspects of the disclosed invention may be embodied as a system, method or process, or computer program product. Accordingly, aspects of the disclosed invention may take the form of an entirely hardware embodiment, an entirely software embodiment (including firmware, resident software, microcode, etc.) or an embodiment combining software and hardware aspects that may all generally be referred to herein as a "circuit," "module," or "system." Furthermore, aspects of the disclosed invention may take the form of a computer program product embodied in one or more computer readable media having computer readable program code embodied thereon.

Any combination of one or more computer readable media (for example, storage system **34**) may be utilized. In the context of this disclosure, a computer readable storage medium may be any tangible or non-transitory medium that can contain, or store a program (for example, the program product **140**) for use by or in connection with an instruction execution system, apparatus, or device. A computer readable storage medium may be, for example, but not limited to, an electronic, magnetic, optical, electromagnetic, infrared, or semiconductor system, apparatus, or device, or any suitable combination of the foregoing.

Aspects of the disclosed invention are described below with reference to block diagrams of methods, apparatus (systems) and computer program products according to embodiments of the invention. It will be understood that each block of the block diagrams, and combinations of blocks in the flowchart illustrations and/or block diagrams, can be implemented by computer program instructions. These computer program instructions may be provided to the processor **116** of a general purpose computer, special purpose computer, or other programmable data processing apparatus to produce a machine, such that the instructions, which execute via the processor of the computer or other programmable data processing apparatus, create means for implementing the functions/acts specified in the flowchart and/or block diagram block or blocks.

Referring now to FIG. 7, a block diagram of a system **200** for providing non-verbal communication between keypad interface panels is shown. The system **200** may connect a first end user **210** to a second end user **230** through the network **220**. The first and second end users **210** and **230** may be personnel in the same facility as described above. The network **220** may include a server **225** storing a software embodiment of the disclosed invention. The end user **210** and end user **230** may interact with the system **200** through respective interface panels which may be in either one case or both a computing device **100** as described above. Likewise, the server **225** may function for example, under the description the computer system/server **100** of FIG. 7. In some embodiments, the network **220** may be a cloud based environment and communication from one interface panel to another may occur through the cloud.

FIG. 8 is a user interface (UI) panel **300** according to an exemplary embodiment. The UI panel **300** may be for example, one of the panels described above. The UI panel **300** may include a controller **310** onto which a memory module **320** may reside. The controller **310** may control functions described above (for example, the illumination of lights **340** which may be the various buttons lit up according

to the above embodiments. A speaker **330** may be connected to the controller **310**. In some embodiments, the speaker **310** may be operated to output a variety of tones so that another form of non-verbal communication may be provided. The memory module **320** may store a palette of tones. In an exemplary embodiment, a specific button press may be linked a specific tone selected from the palette of multiple tones. For example, a sound tone may be emitted when a specific button is pressed first in a sequence, or when a button is pressed in combinations with other buttons pressed within any of the groups described above. The memory module **320** may also define a specific group of buttons (2 or more) that when pressed together or sequentially result in a defined group, which causes a different tone. In some embodiments, a tone may override any previous button/toning made with buttons chosen in the group. In some embodiments, illuminated buttons may also flash at rates which express a message. Tones may occur in sequence with the flash rate using the tone defined for the button. The flash rates of message may be stored in the memory module **320**. In some embodiments, the controller **310** may trigger all connected panels to play tones and flash concurrently.

Referring now to FIG. **9**, a method **400** of delivering a non-verbal communication through tones is shown according to an embodiment. A palette of tones may be stored **410** in memory of the system. Selected tones from the palette may be stored **420** in association with a sequence of keys or buttons pressed from groups of keys/buttons. In response to a user operating one panel, another panel may receive **430** a message represented by a sequence of keys pressed within different groups of keys. In some embodiments, the controller of the receiving panel may determine **440** a flash rate of a button lit by the sequence of key presses. The controller of the receiving panel may retrieve **450** from memory, a selected tone(s) associated with the key presses. The panel may trigger **460** an audio output of the tone(s). In some embodiments, the tones may be played **470** at a frequency associated with the flash rate of buttons.

Persons of ordinary skill in the art may appreciate that numerous design configurations may be possible to enjoy the functional benefits of the inventive systems. Thus, given the wide variety of configurations and arrangements of embodiments of the present invention the scope of the invention is reflected by the breadth of the claims below rather than narrowed by the embodiments described above. For example, the user interface panel described in FIGS. **2** and **3** is not necessarily a preferred embodiment and is merely an example of one customized station. Other stations may be customized based on customer needs and may include labels of different meanings pre-defined to represent personnel of various amounts of each (for example, secretaries 1-5), different actions and more than one category of actions (for example, one category for actions related to retrieving items such as files, tools, etc. and one category for actions designating what to be done with the retrieved item (for example, bring to a person, dispose of the item, refresh a supply, etc.). Thus, depending on the numbers of people, actions, and locations a user wants in their system, several permutations can be designed to fit the needs of the customer.

What is claimed is:

1. A system, comprising:
 - a plurality of keypad interface panels, each panel including,
 - a speaker;
 - a memory storage module including stored electronic files of tones, a memory storage module including stored electronic files of tones,
 - a plurality of grouped sets of touch-enabled keys, each set of keys in a group is arranged in a vertical grouping as defined by a common function, wherein
 - a first group of keys is designated to represent pre-set persons within an office setting,
 - a second group of keys is designated to represent a pre-designated action within the office setting,
 - a third group of keys is designated to represent a location in the office setting, and
 - when a first selected key within the first group of keys, a second selected key within the second group of keys, and a third selected key within the third group of keys are pressed, emits, by the speaker, a selected tone from the stored electronic files of tones and represents an audible and non-verbal form of communication between the plurality of keypad interface panels identifying a selected person, a selected action for the selected person, and a selected location for the selected person to perform the selected action;
 - one or more communication cables connecting the plurality of keypad interface panels; and
 - a central switchbox controller configured to control the receipt and transmission of signals between the plurality of keypad interface panels through the one or more communication cables.
2. The system of claim **1**, wherein in response to a plurality of selected keys being pressed on one of the plurality of keypad interface panels by a first user, lighting up the same keys on at least one other of the plurality of keypad interface panels.
3. The system of claim **2**, wherein the plurality of selected keys pressed represent a sequence of pre-defined non-verbal cues to a recipient user at the at least one other of the plurality of keypad interface panels.
4. The system of claim **2**, wherein the lit-up keys on the at least one other of the plurality of keypad interface panels flash at a frequency rate.
5. The system of claim **4**, wherein the selected audible tone is played at a frequency corresponding to the flash frequency rate of the lit-up keys.
6. The system of claim **1**, further comprising a mobile computing device including a software application configured to display a digital keypad interface panel with digital keys arranged according to said plurality of grouped sets of keys, wherein the software application communicates wirelessly with the central switchbox and the plurality of keypad interface panels.
7. The system of claim **1**, wherein each key within a selected grouped set of keys includes indicia or a color code representing the different person or different function within the office setting.